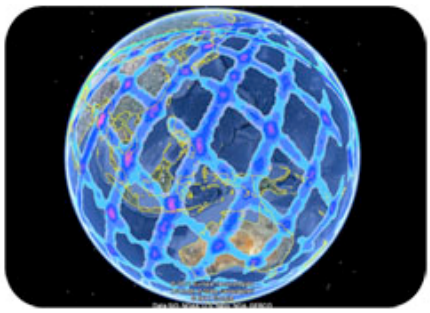
LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, March 12-16, 2012

R&D

WATCH OUT FOR THAT SPACECRAFT



This graphic is a probability density map overlaid on top of the Earth to help predict where space junk will fall. Graphic by Deborah Dennison based on calculations made by Matt Horsley.

Last December, Laboratory scientists received a call from the Air Force Joint Space Operations Center about how the Russians had launched a mission to Phobos, one of the moons of Mars, but it failed to escape Earth's orbit.

With the help of the Lab's Space Situational Awareness team, the Homeland-Defense Operational Planning System, and the National Atmospheric Release Advisory Center, scientists were able to help predict where the spacecraft would return to Earth.

Accurate prediction of spacecraft re-entries has long been challenging because the forces that act to slow down the satellite are complex and dynamic. The high altitude atmosphere is an important contributor to this force, and the composition of this atmosphere can change rapidly with changes in the sun's intensity. In order to model these effects correctly, it is important to understand how these contributing forces change over time.

LLNL researchers developed the software infrastructure necessary to make a series of increasingly accurate predictions for re-entry, and more importantly, to quantify the uncertainty in these predictions.

To read more, go to *R&D Magazine*.

ON A PATH TOWARD THE SUN

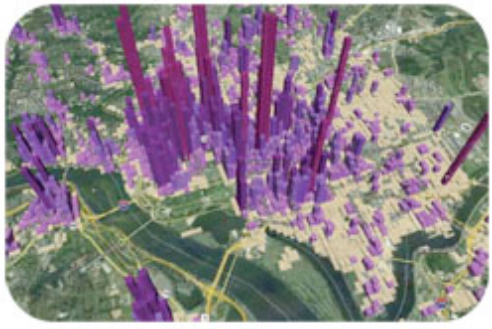
Using the world's largest laser, Lawrence Livermore scientists are on the path to creating the same energy – fusion -- that powers the sun and stars.

National Ignition Facility scientists have been leading a two-year nationwide campaign to achieve break-even fusion, commonly referred to as "ignition," meaning that more energy is released than is put in.

"We have all the capability to make it happen in fiscal year 2012," says Ed Moses, NIF director.

To read more, go to *American Security Project*.

PREPARING FOR THE FALLOUT



The finer of two modeling scales for downtown Washington, D.C. to illustrate typical daytime population density. By incorporating other modeled information, each cell also can be used to display overpressures from a nuclear blast, thermal effects, prompt radiation and fallout doses.

What would happen if a 10 kiloton nuclear explosive were detonated in downtown Washington, D.C. at the intersection of 16th and K streets NW?

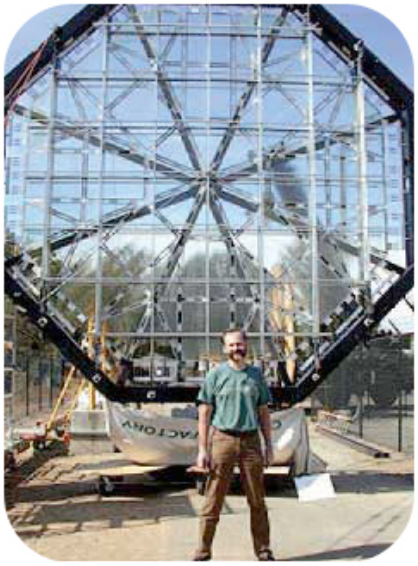
That question is posed by a recent study performed for the Federal Emergency Management Agency. It assesses the impact of a nuclear terrorism incident in the nation's capital and seeks to derive the appropriate lessons for emergency response planning purposes.

The Lab's Brooke Buddemeier is the key author of the report and states that it is clear that a nuclear detonation would "overwhelm response resources in the area." On the other hand, "the existing Washington, D.C. structures offered better than adequate protection for a shelter-in-place strategy that would reduce the number of potential acute radiation casualties by 98 percent.

To read more, go to *FAS*.

The Christian Science Monitor

KEEPING AN EYE ON THE SKY



The Eyeglass Space Telescope

In 2000, when the Laboratory wanted to design a telescope whose football-field sized lens could be folded into a small rocket, they approached an expert in a discipline not traditionally associated with aerospace and engineering: origami.

Robert Lang, who has published 13 books on origami, also has degrees in engineering and physics and an extensive background in optics, but it was his expertise in folding paper that inspired the Eyeglass Space Telescope, whose thin plastic lens, designed to be 40 times larger than that of the Hubble Space Telescope, would open like an umbrella in space.

The Eyeglass would have consisted of two cooperating spacecraft separated in space by a few kilometers. A large-aperture primary lens (magnifying glass) collects light and a secondary lens (eyepiece) moves along the focal surface for imaging. Eyeglass uses diffractive optics instead of mirrors or conventional glass lenses.

The prototypes worked as predicted, showing that the Japanese art of paper folding has applications that go well beyond making paper cranes. Funding for the Eyeglass Telescope was discontinued before a full-scale version could be built, but the idea remains intriguing.

To read more, go to *The Christian Science Monitor*.
